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## **(54) PELLICLE FOR LITHOGRAPHY**

### **(57)Abstract:**

**PURPOSE:** To obtain a pellicle which causes no color change into yellow nor cracking even when used in a short wavelength region by adhering a pellicle film consisting of a fluorine-base org. material to a pellicle frame with an adhesive consisting of a fluorine-base org. material.

**CONSTITUTION:** This pellicle film consists of a fluorine-base org. material, and the adhesive used to adhere this pellicle film to a pellicle frame is the same kind or similar kind of the fluorine-base org. material of the film. The fluorine-base org. material is preferably an amorphous compd. having a cyclic structure. By adhering the pellicle film to the pellicle frame with the adhesive consisting of the same or similar kind of the fluorine-base org. material which constitutes the pellicle film, no peeling is caused. This adhesive has large adhesion strength and causes no deterioration by light, so that the pellicle film causes no peeling nor cracking due to changes in tensile strength. Thus, the pellicle can be used stably for a long time.

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

#### [0001]

[Industrial Application] This invention is on the real target used as dust \*\*\*\* at the time of manufacturing a semiconductor device or liquid crystal display panels, such as a pellicle for lithography especially LSI, and a VLSI. It is related with the pellicle for lithography in the exposure method using light 500nm or less by which electrification prevention was carried out.

#### [0002]

[Description of the Prior Art] Although light is reflected in a semi-conductor wafer or the original edition for liquid crystal and patterning is created in manufacture of semiconductor devices, such as LSI and a VLSI, or a liquid crystal display panel In this case, if dust has adhered to the exposure original edition to be used, in order for this dust to absorb light or to bend light, Imprinted patterning deformed, or the edge became an ill-behaved \*\*\*\* thing, and also the white ground became dirty black, a dimension, quality, an appearance, etc. were spoiled, and there was a problem of causing the engine performance of a semiconductor device, a liquid crystal display panel, etc. and lowering of the manufacture yield. For this reason, although these activities are usually done in the clean room, since it is difficult to always maintain the exposure original edition at clarification also in this clean room, the approach of sticking on the front face of the exposure original edition the pellicle which often passes the light for the exposure for dust \*\*\*\* is performed.

[0003] In this case, although it will become unrelated [ the dust on a pellicle ] to an imprint if the focus is doubled on the pattern of the exposure original edition at the time of lithography since dust does not adhere directly on the front face of the exposure original edition but it adheres on a pellicle This pellicle film the transparent film which consists of a nitrocellulose which passes light well, cellulose acetate, etc. Aluminum, The good solvent of the pellicle film is applied to the upper part of the pellicle frame which consists of stainless steel, polyethylene, etc. being air-dry -- pasting up (referring to JP,58-219023,A) -- adhesives, such as acrylic resin and an epoxy resin, -- pasting up (United States patent 4th -861 and a 402 number description --) JP,63-27,B and 707 Since the lower part of referring to the number official report and a pellicle frame is equipped with the exposure original edition, it consists of an adhesive layer which consists of polybutene resin, polyvinyl acetate resin, acrylic resin, etc., and a mold release layer (separator) aiming at protection of an adhesive layer.

#### [0004]

[Problem(s) to be Solved by the Invention] In this pellicle structure, since the adhesives which make the pellicle film and a pellicle frame fix the film are put to the direct exposure light source at the time of lithography, especially endurance is important, and since these adhesives need making it paste up where a several microns super-thin film is always stretched in a frame, it is an important ingredient on the engine performance of a pellicle. However, since the acrylic adhesives or epoxy system adhesives of bond strength currently used conventionally are not inadequate or adhesion area is not fixed, when these adhesives have the intense photodegradation by the exposure light source and it uses it to some extent, the dependability of also generating Siwa is missing, adhesives solidify and decompose, this serves as a

dust source of release, and they have further the fault of the film exfoliating or causing a crack by tension change of the pellicle film further. Moreover, when a fluorination polymer amorphous as construction material of the pellicle film is used, since the fluorine polymer is excellent in the mold-release characteristic, it can obtain practical adhesive strength neither with acrylic adhesives nor epoxy system adhesives.

[0005]

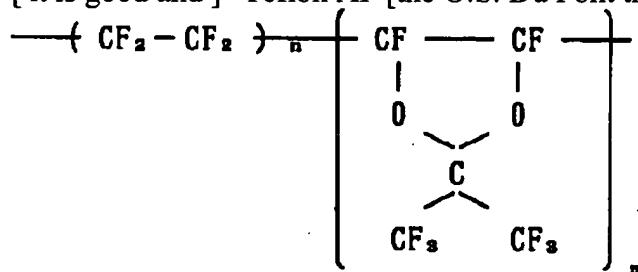
[Means for Solving the Problem] It is characterized by this coming to paste [ a pellicle frame ] the pellicle film which consists of the fluorine organic substance with the adhesives which consist of the fluorine system organic substance about the pellicle for lithography to which this invention solved such disadvantage.

[0006] Namely, as a result of examining many things that this invention persons should develop a pellicle without disadvantage which was described above, when consisting the pellicle film of the fluorine system organic substance Since the bond strength of the thing which consists of the similar fluorine system organic substance, then these adhesives is large as of the same kind as this pellicle film and photodegradation is not carried out substantially, either, the adhesives for pasting up this pellicle film on a pellicle frame It checked that what is necessary is to be long lasting and just to use a polymer of a fluorine system with which this invention persons have already proposed that the pellicle of high performance can be obtained also about a header and this pellicle film, and this invention was completed. This is explained further in full detail below.

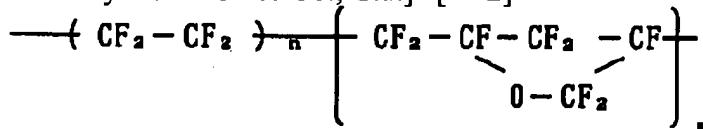
[0007]

[Function] This invention is what is characterized by this coming to paste [ a pellicle frame ] the pellicle film which consists of the fluorine system organic substance with the adhesives which consist of the fluorine organic substance about the pellicle for lithography. According to this, the bond strength of these adhesives is large, they do not carry out photodegradation substantially, and this being as of the same kind as the pellicle film or the profitableness that it is long lasting and the pellicle of high performance can be obtained from it being what consists of the similar fluorine system organic substance is given.

[0008] The pellicle for lithography of this invention shall paste up the pellicle film which consists of the fluorine system organic substance on a pellicle frame with the adhesives which consist of the fluorine system organic substance, and shall become. The fluorine system organic substance which makes this pellicle film is a formula [\*\* 1] marketed by this by the fluorine polymer of the amorphism nature obtained by copolymerizing the tetrafluoroethylene which this invention persons have already proposed, and the fluorine-containing monomer which has an annular perfluoro ether group, then the trade name of [ it is good and ] "Teflon AF [the U.S. Du Pont trade name]."



The thing come out of and shown, or the formula marketed by the trade name of "SAITOPPU [the trade name by Asahi Glass Co., Ltd.]" [\*\* 2]



It comes out and what is shown is illustrated (refer to JP,4-104155,A).

[0009] In addition, manufacture of the pellicle film from this fluorine system organic substance After

dissolving this compound in 3 - 10% of concentration using a solvent (2-butyl tetrahydrofuran), for example, the perfluoro, perfluoro (2-propyl TETORADORO pyran), etc. of a fluorine system, although what is necessary is just to form membranes by the solution axle-pin-rake method using a spin coater or a knife coating machine -- thickness of this film 0.5-10 micrometers -- desirable -- a 0.8-5-micrometer thing -- then, are good and let the permeability of light be 95% or more of thing from the field where this thing is practical.

[0010] The made pellicle film has good stability. Thus, yellow while in use or A crack is not generated. For example, g line (wavelength 436nm), i line (wavelength 365nm), Wavelength which is the activity range of an excimer laser (KrF laser; wavelength 248nm) 210-500nm Since it also sets and the outstanding transparency is shown, and it says that lowering of transparency is not accepted even if it carries out a long duration activity, the physical properties which were excellent also as pellicle film are shown.

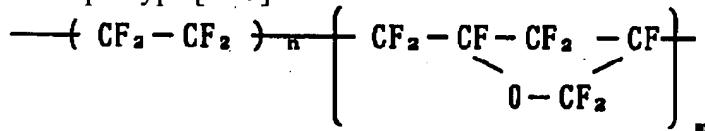
[0011] Moreover, although a pellicle frame is pasted in this invention with that the pellicle film which consists of this fluorine system organic substance is the same as that of this fluorine system organic substance, or the adhesives which consists of the similar fluorine system organic substance Although Teflon AF (above), SAITOPPU (above), etc. which were described above as adhesives which consist of this fluorine system organic substance are sufficient, in order to raise an adhesive property with a frame, it is good to use what processed Teflon AF and the end of SAITOPPU by the acrylic or the methoxy group. In addition, it shall be easy to be well-known [ the pellicle frame used here ], therefore this shall just be made from aluminum, stainless steel, etc.

[0012] Although the pellicle for lithography of this invention comes to paste [ a pellicle frame ] the pellicle film which consists of quality of fluorine system organic with the adhesives which consist of the fluorine system organic substance as described above Since the pellicle frame is pasted with the same as that of the quality of fluorine system organic from which the pellicle film constitutes this pellicle film, or the adhesives which consists of the similar quality of fluorine system organic according to this This does not exfoliate, these adhesives have large bond strength, and since photodegradation is not carried out, the profitableness that it can be used being stabilized for a long time is given, without the film's exfoliating in tension change or causing a crack, as for this pellicle film.

[0013]

[Example] Next, the example of this invention is given.

Example type [\*\* 3]



It is come out and shown and is the mole ratio of n and m. The polymer of the tetrafluoroethylene whose n/m is 0.52/1, and the fluorine-containing monomer which has an annular perfluoro ether group, and a SAITOPPU CTXS type [the trade name by Asahi Glass Co., Ltd.] are dissolved in the solvent CTsolv 180 [the trade name by Asahi Glass Co., Ltd.], and it is concentration. 6.0% of solution was prepared.

[0014] Subsequently, it is a diameter about this solution. The spin coater was used, and the transparent membrane which is 0.84 micrometers was made to form, and thickness dried to 200mm and the quartz substrate side with a thickness of 3mm which carried out surface polish for 15 minutes by 180 \*\*, and formed the pellicle film in it.

[0015] On the other hand, alumite processing was carried out as a pellicle frame. On the top face of the aluminum frame of 120mm angle The SAITOPPU CTXA type [the trade name by Asahi Glass Co., Ltd.] as the fluorine system organic substance was dissolved in CTsolv 160 as the solvent [the trade name by Asahi Glass Co., Ltd.]. The adhesives which consist of the fluorine organic substance of concentration 9.0% are applied. This aluminum frame after carrying out an air dried for 3 hours It carries so that this adhesives spreading side may turn up on a 130-degree C hot plate, and the pellicle film obtained above after 5 minutes was put on this adhesives spreading side, and was pasted up.

[0016] Subsequently, when this pellicle film was exfoliated from the substrate and the excessive film was removed, the pellicle which the pellicle film which consists of the fluorine system organic substance has pasted up on the aluminum frame with strong bond strength was obtained, by tension change, the film did not exfoliate and this pellicle film did not cause a crack.

[0017]

[Effect of the Invention] Although this invention is characterized by this coming to paste [ a pellicle frame ] the pellicle film which consists of the fluorine system organic substance as described above with the adhesives which consist of the fluorine system organic substance about the pellicle for lithography Since this pellicle film shall consist of the fluorine system organic substance, even if it uses this thing in a short wave field, yellow, or Since there is also no crack initiation and this does not have of the same kind or not exfoliating since it has pasted up with adhesives from the similar fluorine system organic substance, and these adhesives having large bond strength, and also carrying out [ this and ] photodegradation in a pellicle frame again The profitableness that it can be used being stabilized for a long time is given without this pellicle film's exfoliating in tension change, or causing a crack.

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[Translation done.]